

Patent Claims

1. External fixator for osteosynthesis, comprising an external retaining member (1) and connecting elements (2) with retaining ends (3) held in the retaining member (1) and with contact ends (4) to be placed on the bone (5), for connecting the retaining member (1) to the bone or to bone parts (5), in particular external fixator for closing a dislocated bone and parts thereof, for example a sternum which has been cut through, characterized in that the connecting elements (2) or the contact ends (4) thereof are not screws or the like, and that the contact ends (4) are only supported on the surface of the bone (5) and are formed in such a way that they or that the connecting elements (2) can exert a lateral clamping/compressive pressure (from the medial direction) on the bones or the bone parts (5),
and that, in the retaining member (1), a control element (6) which is supported in the retaining member (1) and by means of which the clamping pressure can be varied is coordinated with each connecting element (2).
2. Fixator according to Claim 1, characterized in that the contact ends (4) are spoon-shaped so that they can at least partly laterally surround a bone (5), for example a sternum.
3. Fixator according to Claim 1 or 2, characterized in that the contact ends (4a, 4c) are profiled so that, when used on the bone surface, they are retained without slipping, and that at least one counter-holder (7) which can be connected or is connected to the retaining member (1) and, in the inserted state, applies pressure to the bone (5) in the distal direction towards the retaining member (1) is provided.
4. Fixator according to any of the preceding Claims, characterized in that the counter-holder comprises at least one flexible, wire- or cable-like loop

- (7) which can be wrapped around the surface of the bone (5) and can be fixed indirectly or directly to the retaining member (1).
5. Fixator according to Claims 2 and 4, characterized in that the loop (7) can be wrapped along the spoon-like formations and around the surface of the bone (5).
10. 6. Fixator according to any of the preceding Claims, characterized in that the connecting elements (2) and/or the retaining member (1) are composed of X-ray-transparent material.
15. 7. Fixator according to Claim 6, characterized in that the loop (7), the connecting elements (2) and/or the retaining member (1) are composed of light metal or of a light metal alloy or of carbon or a carbon-reinforced material.
20. 8. Fixator according to any of the preceding Claims, characterized in that in each case loops (7) mounted singly or in association are coordinated with two connecting elements (2) each, which loops are preferably supported in or on the connecting elements (2).
25. 9. Fixator according to any of the preceding Claims, characterized in that the connecting elements (2) are U- or I-shaped in section, and that they are formed in such a way that the loop (7) is led or can be led in a U or in an I and, in the assembled state, each loop (7) wraps around one connecting element (2a; 2c) each on a bone part (5a) and one connecting element (2b; 2d) each on another bone part (5b) and the two bone parts (5a, 5b) and can be fixed to the retaining member (1).
30. 10. Fixator according to any of the preceding Claims 1 to 8, characterized in that the connecting elements (2) are hollow, in particular tubular, and can cooperate with the loop (7) or with the loops (7) so that, in the assembled

state, each loop (7) winds through one connecting element (2a; 2c) each on a bone part (5a) and another connecting element (2b; 2d) each on another bone part (5b) and wraps around both bone parts (5a, 5b) and can be fixed to the retaining member (1).

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11. Fixator according to any of the preceding Claims, characterized in that the tubular connecting element (2) has at least one lateral orifice (8), a distance away from the contact end (4), for entry or emergence of the loop (7).
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12. Fixator according to any of the preceding Claims, characterized in that the contact end (4c, 4d) is bevelled in the manner of a wedge or rounded along a curve and preferably toothed.
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13. Fixator according to any of the preceding Claims, characterized in that clamping screws (10) – preferably locking screws – for clamping the loop (7) or the loops (7) to the retaining member (1) are provided in the retaining member (1).
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14. Fixator according to any of the preceding Claims, characterized in that the two connecting elements (2) coordinated with one another in each case in one parallel transverse plane each or in a plane normal to the retaining member (1) are pivotably mounted transversely to the longitudinal dimension thereof in the latter, and that the connecting elements (2) are additionally preferably displaceable or pivotable in one plane each parallel to the sagittal plane or in one plane each normal to the retaining member (1), along the longitudinal dimension of the latter.
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15. Fixator according to any of the preceding Claims, characterized in that the control element (6b) comprises a screw or a threaded pin (14), which screw or which threaded pin makes indirect or direct lateral contact with one connecting element (2b, 2c) each and thus defines the pivot position

thereof relative to the retaining member (1).

16. Fixator according to any of the preceding Claims, characterized in that, in the inserted state, it cooperates with a zip system (11) for skin closure, 5 said system being perforated in the region of the connecting elements (2).
17. Fixator according to any of the preceding Claims, characterized in that the connecting elements (2) comprise an elastic closure which closes 10 (applies a tampon to) its cavity but which can pass through the loop (7), the closure preferably comprising a sterile or biocidal material, in particular wax, fabric or foam.
18. Fixator according to any of the preceding Claims, characterized in that 15 the retaining member (1) comprises a cover which makes the region of the retaining ends (3) closable so that this fixator is a completely self-contained system.
19. Fixator according to any of the preceding Claims, characterized in that 20 the loop (7) is held in a clamping mechanism which can be released or tensioned stepwise or in stages.
20. Fixator according to any of the preceding Claims, characterized in that 25 the clamping mechanism comprises a screw nipple of the Bowden cable type.
21. Fixator, in particular according to any of the preceding Claims, for osteosynthesis or bone gap manipulation on bones (5) cut through longitudinally, comprising an external retaining member (1) and 30 connecting elements (2) with retaining ends (3) held in the retaining member (1) and with contact ends (4) to be placed on the bone (5), for connecting the retaining member (1) to the bone or to bone parts (5),

and comprising a counter-holder (7) which holds the bone (5) distally in the direction of the retaining member (1), in particular external fixator for closing a sternum opened along the sagittal plane, characterized in that the connecting elements (2) or the contact ends (4) thereof are not screws or the like, and that the contact ends are only supported on the surface of the bone (5) and are formed in such a way that they or that the connecting elements (2) can exert a lateral clamping pressure (directed towards the sagittal plane) on the bone or the bone parts (5), the counter-holder comprising at least one flexible wire- or cable-like loop (7) which can be wrapped around the medial and lateral surface of the bone and can be fixed indirectly or directly to the retaining member (1).

22. Fixator according to Claim 21, characterized in that, in the retaining member (1), a control element (6) which is supported in the retaining member and by means of which the clamping pressure of the loop (7) can be varied is coordinated with each connecting element (2) or each loop (7).

23. Fixator according to Claim 21 or 22, characterized in that the or each loop (7) is supported on and/or led to at least two connecting elements (2) each.